

M8050A High-Performance BERT, 120 GBaud

SD7150A 1.6T RX and TX Test Solution, V1.2

Overview

This M8050A configuration guide will help you to determine the correct product options, measurement applications, accessories, related software, and services to get the optimal configuration for your high-performance BERT.



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M8050A System Structure

This step-by-step process will lead you through the configuration of your new M8050A high performance BERT, depending on the baud rate and other application requirements. The table below provides an overview of the currently available modules and chassis configurations along with the software packages that come with the M8050A.

Product	Description	Comment
M8050A	High Performance BERT System	System level ordering
BERT modules		
M8042A	Pattern Generator Module 32/64/120 GBd, 2 or 3-slot AXIe	Pattern generator for all baud rates, number of slots occupied depends on number of channels
M8009A	Clock Generator Module with Jitter Modulation, 60 GHz, 1 slot AXIe	Clock module up to 60 GHz, required with Pattern Generator
M8054A	Interference Source Module, 1-slot AXIe	Interference source up to 32 GHz
M8050A chassis options		
M8050A-BU2	Bundle consisting of one M9505A 5-slot AXIe Chassis with USB	Select for most compact 1 channel complete BERT setup
M8050A-BU3	Bundle consisting of one M9505A 5-slot AXIe Chassis and one M9537A AXIe Embedded PC Controller with 16GB RAM and Windows 10	Select when AXIe based PC is required and BERT System with pattern generation or error analysis is required
M8050A-BU4	Bundle consisting of two M9505A 5-slot AXIe Chassis with USB	Recommended for multi-channel and PCIe applications that require additional interference source
M8050A-BU5	Bundle consisting of two M9505A 5-slot AXIe Chassis with USB and one M9537A AXIe Embedded PC Controller with 16GB RAM and Windows 10	Recommended for multi-channel and PCIe applications that require additional interference source and an integrated AXIe PC is required
M8070B system software		
M8070B	M8070B System Software	Base software package required to operate the BERT. Free download: M8070B
M8070ADVB	M8070ADVB Advanced Measurement Package for M8000 Series of BERT Test Solutions	Advanced features like automated jitter tolerance test and parameter sweeps, eye diagram measurement
M8070EDAB	M8070EDAB Error Distribution Analysis Package for M8000 Series BER Test Solutions	Provides burst mechanism detection and analysis, frame loss ratio estimation and error mapping
M8070ISIB	Adjustable ISI Channel Emulation Package for M8000 Series of BER Test Solutions	Provides adjustable ISI emulation. Not yet orderable.

M8050A accessories and replacement items

The table below lists all accessories to operate the M8050A that are included with the product, unless indicated “not included” marked in comments below. The listed accessories can be ordered independent from module in case a replacement is required.

Option number	Description	Comment
M8042A-801	Clock Cable Semi-rigid for Pattern Generator M8042A, Channel 1	Replacement cable. Part of M8050A-KIT-101 (one channel) and M8050A-KIT-102 (two channel).
M8042A-802	Clock Cable Semi-rigid for Pattern Generator M8042A, Channel 2	Replacement cable. Part of M8050A-KIT-101 (one channel) and M8050A-KIT-102 (two channel).
M8042A-803	Synchronization Cable, Semi-rigid for Pattern Generator M8042A and M8009A	Replacement cable. Part of M8050A-KIT-101 (one channel) and M8050A-KIT-102 (two channel).
M8042A-810	Cable Kit for synchronizing second Pattern Generator M8042A	Use when two clock modules need to be synchronized, not included .
M8045A-802	Matched Directional Coupler Pair for external Interference Source, 50 GHz, 13 dB, 2.4 mm	Coupler to feed interference source signal to pattern generator output signal, not included .
M8045A-803	Matched Coupler Pair for external Interference Source, 40 GHz, 12 dB, 2.4 mm	Coupler to feed interference source signal to pattern generator output signal, not included .
M8050A-801	Cable Kit for synchronizing for additional Clock Module M8009A in second Chassis	Use when two clock modules need to be synchronized beyond AX1e chassis ¹ , not included .
M8058A-801	Matched Cable Pair, 1.85 mm (m) to 1.85 mm (m), 2 ps, 0.15 m	Replacement cable from M8058A output to DUT, for -G32 and -G64 option selection. Part of M8050A-KIT-105.
M8059A-801	Matched Cable Pair, 1.0 mm (m) to 1.0 mm (m), 1.0 ps, 0.15 m	Replacement cable from M8059A output to DUT, for -G12 option selection. Part of M8050A-KIT-106.
M8009A-801	Clock module extension cable (required with more than one clock module)	Use this to synchronize two clock modules between two AX1e chassis ¹ . Not included .
M8058A-802	Termination 50 Ohm, 1.85 mm (m)	Replacement termination. Part of M8050A-KIT-105.
M8059A-802	Termination 50 Ohm, 1.0 mm (m)	Replacement termination. Part of M8050A-KIT-106.
M9505A-801	Additional Filler Blade	Additional filler blade, required typically in 2 chassis setups
54964-03801	Wrench – 2 mm thick, dual-ended, fits 6 mm and 7 mm	Part of M8050A-KIT
54964-03802	Wrench – 1.5 mm thick, dual-ended, fits 8 mm	Part of M8050A-KIT
8710-1765	Wrench – Torque 8lb-in, 5/16 Inch	Part of M8050A-KIT
8710-2812	Wrench – Torque 4-in-lb 6 mm – open end Gold-Handle	Part of M8050A-KIT
9300-2665	ESD Mat w/ground Cord-Keysight branded	Part of M8050A-KIT
M8000-91B20	M8050A Start Here	Part of M8050A-KIT
M8000-91B21	M8050A Getting Started Guide	Part of M8050A-KIT
M8070-10102	M8070B Software Media Kit	Part of M8050A-KIT
M8100-91B30	Tips for Preventing Damage	Part of M8050A-KIT
8121-1243	Cable-Assembly USB Type-A Plug to Mini-B Plug 28-AWG 5-Conductor 5VDC 0.5A 2m-LG PVC	Part of M8050A-KIT
M8042-03801	Wrench – 9 mm Dual Ended	Part of M8050A-KIT

1. Two clock module synchronization is currently not supported.

ISI channel boards

ISI channel boards can optionally be added to an M8050A order but must be ordered as a separate line item. It is not available under the M8050A product.

Option number	Description	Comment
M8049A-001	ISI Channel Board, Five Traces from 1.4 to 5.5 inches	
M8049A-002	ISI Channel Board, Nine Traces from 0.8 to 8.0 inches	
M8049A-003	ISI Channel Board, Seven Traces from 9.1 to 22.3 inches	

Step 1: M8042A Pattern Generator Configuration

The pattern generator AXIe module requires one remote head per Pattern Generator channel.

The correct type and the correct number of remote heads is automatically added to the order depending on the selection of the number of channels. Manual modifications are possible.

The pattern generator has no internal clock and always requires an M8009A clock module.



M8042A-0G1



M8042A-0G2

Step 1a: Select number of pattern generator channels

The pattern generator is offered either as a one channel (2-slot AXIe) or as a two channel (3-slot AXIe) module. These are different hardware modules; therefore, a license-based upgrade is not possible from one to two channels. Upgrading from one to two channels requires a second one channel pattern generator that can be supplied by the same clock module. The more compact alternative is the two channel -0G2 option within new M8042A.

Option number	Description	Comment
M8042A-0G1	Pattern Generator NRZ and PAM4, 1 Channel, 2-slot AXIe Module	Standard selection. Adds one remote heads M8058A or M8059A.
M8042A-0G2	Pattern Generator NRZ and PAM4, 2 Channel, 3-slot AXIe Module	2nd channel is typically used when crosstalk test is required. Adds two remote heads M8058A or M8059A.

Step 1b: Select maximum baud rate

The M8042A Pattern Generator is offered with baud rates of 32, 64 or 120 GBd and can be upgraded with software license to the next baud rate. Depending upon the selection the correct remote head will be added to the system and cannot be removed.

Option number	Description	Comment
M8042A-G32	Pattern Generator, 32 GBd for NRZ and PAM4, module-wide License	Up to 32 GBd NRZ and PAM4. One or two M8058A added, dependent on option 0G1 or 0G2 selection.
M8042A-G64	Pattern Generator, 64 GBd for NRZ and PAM4, module-wide License	Up to 64 GBd NRZ and PAM4. One or two M8058A added, dependent on option 0G1 or 0G2 selection.
M8042A-G12	Pattern Generator, 120 GBd for NRZ and PAM4, module-wide License	Up to 120 GBd NRZ and PAM4. One M8059A added. 2 channel 120 GBd currently not supported.

Step 1c: Select optional features

Options to extend the functionality of the pattern generator.

Option number	Description	Comment
M8042A-0G4	De-emphasis, module-wide License	Optional selection
M8042A-0P6	PAM6 Encoding, Module-wide License	Enable generating PAM6 line coding. Not yet orderable.
M8042A-0P8	PAM8 Encoding, Module-wide License	Enable generating PAM8 line coding. Not yet orderable.

M8042A accessories

The table lists all accessories to operate the M8042A that are included with the product, unless indicated “not included” marked in comments below. The listed accessories can be ordered independent from module in case a replacement is required.

Keysight order number	Options	Comment
9230-0333	Calibration certificate	
M8042A-801	Clock Cable Semi-rigid for Pattern Generator M8042A, Channel 1	Part of M8050A-KIT-101 (one channel) and M8050A-KIT-102 (two channel).
M8042A-802	Clock Cable Semi-rigid for Pattern Generator M8042A, Channel 2	Part of M8050A-KIT-101 (one channel) and M8050A-KIT-102 (two channel).
M8042A-803	Synchronization Cable, Semi-rigid to sync Pattern Generator M8042A with M8009A	Part of M8050A-KIT-101 (one channel) and M8050A-KIT-102 (two channel).

M8058A and M8059A remote heads for M8042A

The M8058A (64 GBd) and the M8059A (120 GBd) remote heads can be ordered as individual products. The configuration system adds the correct type and quantity of remote heads based on the M8042A baud rate selection and the number of channels that are selected.



M8058A Remote head for M8042A



M8059A Remote head for M8042A

Option number	Description	Comment
M8058A	Remote Head, 32/64 GBd for M8042A Pattern Generator	Operates up to 64 GBd
M8059A	Remote Head, 120 GBd for M8042A Pattern Generator	Required for operation up to 120 GBd

M8058A accessories

The table lists all accessories to operate the M8058A that are included with the product, unless indicated “not included” marked in comments below. The listed accessories can be ordered independent from module in case a replacement is required.

Option number	Description	Comment
M8058A-801	Matched Cable Pair, 1.85 mm (m) to 1.85 mm (m), 2 ps, 0.15 m	Cable to DUT for M8058A. Part of M8050A-KIT-105.
M8058A-802	Termination 50 Ohm, 1.85 mm (m)	Required for single ended operation for open output of M8058A. Part of M8050A-KIT-105.

M8059A accessories

The table lists all accessories to operate the M8059A that are included with the product, unless indicated “not included” marked in comments below. The listed accessories can be ordered independent from module in case a replacement is required.

Keysight order number	Options	Comment
M8059A-801	Matched Cable Pair, 1.0 mm (m) to 1.0 mm (m), 1.0 ps, 0.15 m	Cable to DUT for M8059A. Part of M8050A-KIT-106.
M8059A-802	Termination 50 Ω , 1.0 mm (m)	Required for single ended operation for open output of M8059A. Part of M8050A-KIT-106.

Step 2: M8009A Clock Module Configuration

A clock module is always required for a pattern generator. The clock module has 2 synchronized clock outputs for clocks up to 32 GHz, one channel can operate as clock output up to 60GHz to support 120 GBd pattern generation.



M8009A

Option number	Description	Comment
M8009A-061	Clock Generator one channel 60 GHz, 1 slot AXIe	Supports 2 to 32 GHz clock on two channels, and 2 to 60 GHz on one channel
M8009A-0G3	Advanced Jitter Modulation for up to two Channels, License	Add jitter capabilities
M8009A-0G6	Reference Clock Multiplier, License	Adds reference clock multiplication support mostly required for PCIe

M8009A accessories

The table lists all accessories to operate the M8009A that are included with the product, unless indicated “not included” marked in comments below. The listed accessories can be ordered independent from module in case a replacement is required.

Keysight order number	Options	Comment
M8009A-801	Clock module extension cable	Required with more than one clock module. Not included.

Step 3: Error Analyzer Configuration

The M8046A Error Analyzer is recommended for real-time error analysis for data rates up to 58 GBd.

For details, please review [M8040A data sheet](#) Error Analyzer sections.

The M8046A Error Analyzer must be ordered as a separate line item. It is not available under the M8050A product.

Step 4: M8054A Interference source

The Keysight M8054A interference source generates repeatable and accurate level impairments for testing of high-speed digital receivers that support symbol rates of up to 64 GBd.



M8054A

No options are available for the interference source.

Step 5: Chassis Selection

The M8050A High Performance BERT is based on AXIe modules. Depending on the selections in previous steps the number of occupied slots might exceed the maximum of 5 slots per chassis. In case the selection requires more than one 5-slot chassis please selected a bundle option that contains two 5-slot AXIe chassis.

In case an external PC is not planned to be used, a bundle containing an embedded controller is required for the operation of the M8050A. The external PC must be furnished by the customer.

Option number	Description	Comment
M8050A-BU2	Bundle consisting of one M9505A 5-slot AXIe Chassis with USB	Standard selection for a complete 1ch channel BERT with pattern generation, clock generation and error analysis
M8050A-BU3	Bundle consisting of one M9505A 5-slot AXIe Chassis and one M9537A AXIe Embedded PC Controller with 16GB RAM and Windows 10	Including an embedded controller may eventually require a 2nd 5-slot chassis
M8050A-BU4	Bundle consisting of two M9505A 5-slot AXIe Chassis with USB	Configuration typically required when a two-channel pattern generator or an additional interference source is selected
M8050A-BU5	Bundle consisting of two M9505A 5-slot AXIe Chassis with USB and one M9537A AXIe Embedded PC Controller with 16GB RAM and Windows 10	Adds embedded controller to advanced system configuration

Step 6: M8070B Software Selection

M8070B software is the base version that provides all features to use the M8050A as a BERT.

This base version is downloadable at no charge from [M8070B system software](#).

These basic functions can be extended with additional measurement packages that can be ordered in the standard ordering process.

Option number	Description	Comment
M8070ADVB	M8070ADVB Advanced Measurement Package for M8000 Series of BERT Test Solutions	Advanced features like automated jitter tolerance test and parameter sweeps, eye diagram measurement
M8070EDAB	M8070EDAB Error Distribution Analysis Package for M8000 Series BER Test Solutions	Provides burst mechanism detection and analysis, frame loss ratio estimation and error mapping
M8070ISIB	Adjustable ISI Channel Emulation Package for M8000 Series of BER Test Solutions	Provides adjustable ISI emulation for M8070B V9.1 and higher. Not yet orderable.

Step 7: Support

With 80+ years of test and technology experience, Keysight knows that your test system up-time, measurement accuracy, and understanding of new technologies are vital to your test and measurement success. There is no need to tackle your technical challenges alone. KeysightCare is committed to providing the help you need now with best-in-class test and measurement customer care and dedicated, proactive support for instruments, software, and solutions. With KeysightCare you can expect faster response times, faster access to specialized experts, and faster time to resolution. This datasheet provides the details and benefits of KeysightCare Technical Support, a key part of KeysightCare, and how you can get started.

Step 7a: Return to Keysight service center - warranty and service plan

Details about the [KeysightCare Technical Support](#).

Option number	Description
1280A	Keysight Care service plan
R-51B-OC	Return to service center warranty and service plan
R-51B-001-3A	Return to Keysight Warranty - 3 years
R-51B-001-3C	Extended Warranty - Return to Keysight - 3 years
R-51B-001-5A	Return to Keysight Warranty - 5 years
R-51B-001-5C	Extended Warranty - Return to Keysight - 5 years
R-51B-001-5F	Extended Warranty - Return to Keysight - 5 years
R-51B-001-A	Return to Keysight Warranty - 3 months
R-51B-001-C	Return to Keysight Warranty - 1 year
R-51B-001-F	Return to Keysight Warranty - 3 years

Step 7b: KeysightCare service plan

Option number	Description
1280KC	Keysight Care service plan
R-55A-001-1	KeysightCare Assured First Year Support
R-55A-001-2	KeysightCare Assured - Extend to 2 years (includes Return to Keysight Extended W
R-55A-001-3	KeysightCare Assured - Extend to 3 years (includes Return to Keysight Extended W
R-55A-001-5	KeysightCare Assured - Extend to 5 years (includes Return to Keysight Extended W
R-55A-001-3CC	KeysightCare Assured - Extend to 3 years
R-55A-001-5CJ	KeysightCare Assured - Extend to 5 years
R-55A-001-5CC	KeysightCare Assured - Extend to 5 years (includes Return to Keysight Extended W
R-55D-001-3Z	KeysightCare Technical Support - 3 years
R-55D-001-5H	KeysightCare Technical Support - 5 years
R-55D-001-5ZJ	KeysightCare Technical Support - 5 years
R-55-KC-OC2	KeysightCare Service Plan OC2
R-55A-001-A	No KeysightCare

Step 7c: Return to Keysight service center calibration plan

Option number	Description
R1282A	Return to Keysight service center - warranty and service plan
R-50C-OC	Calibration service plan
R-50C-011-3	Calibration Plan - Return to Keysight - 3 years
R-50C-011-5	Calibration Plan - Return to Keysight - 5 years
R-50C-016-3	Keysight Calibration + Uncertainties + Guard banding - 3 years
R-50C-016-5	Keysight Calibration + Uncertainties + Guard banding - 5 years
R-50C-021-3	ANSI Z540-1-1994 Calibration - 3 years
R-50C-021-5	ANSI Z540-1-1994 Calibration - 5 years
R-50C-011-3	Calibration Plan - Return to Keysight - 3 years
R-50C-011-5	Calibration Plan - Return to Keysight - 5 years

Upgrade Options

Upgrade options can be found under M8050AU. This structure covers all upgrades for all modules available under the M8050A. Each is license key enabled.

Option number	Description	Comment
M8050AU	Upgrades to High-Performance BERT, 120 GBd	Upgrade structure for M8050A module upgrade
M8042A pattern generator Module 32/64/120 GBd, 2 or 3-slot AXIe		
M8042A-U64	Upgrade from 32 to 64 GBd for M8042A Pattern Generator including NRZ and PAM4 module-wide license	Includes NRZ and PAM4, M8058A remote head from M8042A-G32 can be used
M8042A-U12	Upgrade from 64 to 120 GBd for M8042A Pattern Generator including NRZ and PAM4 module-wide license	Will also need to purchase M8059A remote heads.
M8042A-UG4	Upgrade to de-emphasis, module-wide license	Add de-emphasis to existing owned M8050A
M8042A-UP6	Upgrade with PAM6 Encoding, module-wide license	Enable generating PAM6 signals, not yet orderable.
M8042A-UP8	Upgrade with PAM8 Encoding, module-wide license	Enable generating PAM8 signals, not yet orderable.
M8009A clock generator module with jitter modulation, 60 GHz, 1 slot AXIe		
M8009A-UG3	Upgrade to Advanced Jitter Modulation for up to two Channels, license	Add jitter capabilities
M8009A-UG6	Upgrade to Reference Clock Multiplier, license	Adds reference clock multiplication capability

SD7150A TX and RX 1.6T Test Solution



The SD7150A 1.6T Receiver and Transmitter Test Solution supports both receiver test, based on the M8050A high Performance BERT and transmitter test with the UXR Oscilloscope. In addition to the TX test capabilities, the UXR can be used as an Error Analyzer up to 120 GBd.

The bundle includes a M8050A 120 GBd Pattern Generator configuration and a UXR0802A or UXR0804A UXR with default memory size and software packages as described in the table below.

The bundle has a pre-defined minimum configuration required for 120 GBd receiver test. Additional options can be added but downgrade by removing required options is not supported.

The SD7150A bundle offers a reduced price for purchasing the M8050A and the UXR at the same time.

Product	Description	Comment
SD7150A	1.6 RX and TX Test Solution	SD7150A Solution bundle
M8050A configurator		
M8050A	BERT System Module Selection	Options preselected that cannot be removed: M8042A-0G1 preselected can be changed to -0G2 M8042A-0G4 M8042A-G12 M8059A (1EA for -0G1, 2 EA for -0G2) M8009A-0G3 M8050A-PA1 negative price adjuster Any other option can be added or modified
M8070ADVB	M8070ADVB Advanced Measurement Package for M8000 Series of BERT Test Solutions	M8070ADVB package required for operation, need to be selected, if not already available.
M8070EDAB	M8070EDAB Error Distribution Analysis Package for M8000 Series BER Test Solutions	M8070EDAB optional software package.
UXR configurator		
UXR0802A	Infiniium UXR Real-Time Oscilloscope, 80 GHz, 256 GSa/s, 2Ch	Select this configuration if 2-channel 80 GHz UXR is required. Required software options that must be added if not already available. <ul style="list-style-type: none"> • D9020ASIA Advanced Signal Integrity Software. • D9010PAMA Pulse Amplitude Modulation PAM-N Analysis Software.
UXR0804A	Infiniium UXR Real-Time Oscilloscope, 80 GHz, 256 GSa/s, 4Ch	Select this configuration if 4-channel 80 GHz UXR is required. Required software options that must be added if not already available. <ul style="list-style-type: none"> • D9020ASIA Advanced Signal Integrity Software. • D9010PAMA Pulse Amplitude Modulation PAM-N Analysis Software.

Related Literature

Description	Pub number
M8050A Data Sheet	3122-1338EN
M8054A Interference Source 32 GHz, Data Sheet	5992-3971EN
M8049A ISI Channel Boards, Data Sheet	5992-3617EN

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